

WHAT IS CLAIMED IS:

- 1 1. An apparatus for the treatment of body conduits, the apparatus
2 comprising:
3 an elongated body configured to be inserted into a body conduit, the
4 elongated body having a proximal end and a distal end; and
5 a source of energy for emitting energy from the elongated body in
6 an intensity which, when applied to walls of the body conduit causes a change in
7 smooth muscle tissue which prevents the smooth muscle tissue from replicating.
- 1 2. The apparatus of Claim 1, wherein the source of energy is a source
2 of light energy and the apparatus further comprises:
3 a light transmitting fiber extending from the proximal end to the
4 distal end of the elongated body for transmitting light into the body conduit;
5 a connector on the distal end of the elongated body for connecting
6 the elongated body to the source of light energy; and
7 a light directing member positioned at a distal end of the elongated
8 device for diffusing or redirecting the light from the light transmitting fiber in a
9 substantially radial pattern from the distal end of the elongated device.
- 1 3. The apparatus of Claim 2, wherein the source of light delivers light
2 having a wavelength of about 240 nm to about 280 nm.
- 1 4. The apparatus of Claim 2, wherein the source of light delivers light
2 in the red visible range.
- 1 5. The apparatus of Claim 1, wherein the source of energy delivers
2 energy having a wavelength and intensity which, when applied to the walls of the
3 body conduit crosslinks DNA in smooth muscle cells surrounding the conduit and
4 prevents the smooth muscle cells from replicating.

1 6. The apparatus of Claim 2, wherein the light directing member
2 includes a substantially conical reflective surface which redirects light from the
3 light transmitting fiber in a direction away from a longitudinal axis of the fiber.

1 7. The apparatus of Claim 6, wherein the reflective surface is concave
2 in cross section.

1 8. The apparatus of Claim 6, wherein the reflective surface is
2 substantially planar in cross section.

1 9. The apparatus of Claim 6, wherein the reflective surface is
2 substantially parabolic in cross section.

1 10. The apparatus of Claim 2, wherein the light directing member
2 includes a diffusing lens which directs light from the transmitting fiber in a
3 direction away from a longitudinal axis of the fiber.

1 11. The apparatus of Claim 2, wherein the light transmitting fiber is
2 surrounded by a sheath for delivery to the airway.

1 12. The apparatus of Claim 11, wherein the sheath includes a distal end
2 section which is transparent to the energy emitted by the light source.

1 13. The apparatus of Claim 11, wherein the sheath includes a distal
2 section having a plurality of windows which are transparent to the energy emitted
3 by the light source to allow the light which has been redirected by the light
4 directing member to exit the sheath.

1 14. The apparatus of Claim 1, wherein the source of energy is a
2 radioactive pellet positioned at the distal end of the elongated body.

1 15. The apparatus of Claim 1, wherein the source of energy is a
2 radioactive pellet which is movable longitudinally within the elongated body to
3 treat the body conduit.

1 16. An apparatus for the treatment of walls of airways in a patient's
2 lungs, the apparatus comprising:

3 an elongated body configured to be inserted into the airways of a
4 patient's lungs, the device having a proximal end and a distal end;

5 a source of energy for emitting energy from the distal end of the
6 elongated body in an intensity which, when applied to the walls of the airway
7 causes a change in smooth muscle tissue which prevents the smooth muscle tissue
8 from replicating.

1 17. The apparatus of Claim 16, wherein the source of energy is a light
2 source and the apparatus further comprises:

3 a light transmitting fiber extending from the proximal end to the
4 distal end of the elongated body for transmitting light from the light source into the
5 patient's lungs;

6 a connector on the distal end of the elongated body for connecting
7 the elongated body to the source of light; and

8 a light directing member positioned at a distal end of the elongated
9 device for diffusing or redirecting the light from the light transmitting fiber in a
10 substantially radial pattern from the distal end of the elongated device.

1 18. The apparatus of Claim 16, wherein the source of energy delivers
2 energy having a wavelength and intensity which, when applied to the walls of the
3 airway crosslinks DNA in smooth muscle cells surrounding the airway and
4 prevents the smooth muscle cells from replicating.

1 19. The apparatus of Claim 16, wherein the source of energy delivers
2 energy having a wavelength and intensity which, when applied to the walls of the
3 airway crosslinks DNA in mucus gland cells surrounding the airway and prevents
4 the mucus gland cells from replicating.

1 20. An apparatus for the treatment of walls of an esophagus, the
2 apparatus comprising:
3 an elongated body configured to be inserted into the esophagus, the
4 elongate body having a proximal end and a distal end; and
5 a source of energy for emitting energy from the elongated body in
6 an intensity which, when applied to the walls of the esophagus causes a change in
7 smooth muscle tissue which prevents the smooth muscle tissue from replicating.

1 21. The apparatus according to Claim 20, wherein the source of energy
2 is a light source and further comprising:
3 a light transmitting fiber extending from the proximal end to the
4 distal end of the elongated body for transmitting light into the esophagus;
5 a connector on the distal end of the elongated body for connecting
6 the elongated body to the source of light; and
7 a light directing member positioned at a distal end of the elongated
8 device for diffusing or redirecting the light from the light transmitting fiber in a
9 substantially radial pattern from the distal end of the elongated device.

1 22. The apparatus of Claim 21, wherein the light source delivers light
2 having a wavelength of about 240 nm to about 280 nm, or delivers light in the red
3 visible range.

1 23. The apparatus of Claim 20, wherein the source of energy is a
2 radioactive pellet positioned within the elongated body.

1 24. An apparatus for treatment of walls of a ureter or urethra, the
2 apparatus comprising:
3 an elongated body configured to be inserted into the ureter or
4 urethra, the device having a proximal end and a distal end; and
5 a source of energy for emitting energy from the elongated body in
6 an intensity which, when applied to the walls of the ureter or urethra causes a
7 change in smooth muscle tissue which prevents the smooth muscle tissue from
8 replicating.

1 25. The apparatus of Claim 24, wherein the source of energy is a light
2 source and further comprising:
3 a light transmitting fiber extending from the proximal end to the
4 distal end of the elongated body for transmitting light into the ureter or urethra;
5 a connector on the distal end of the elongated body for connecting
6 the elongated body to the source of light; and
7 a light directing member positioned at a distal end of the elongated
8 device for diffusing or redirecting the light from the light transmitting fiber in a
9 substantially radial pattern from the distal end of the elongated device.

1 26. The apparatus of Claim 25, wherein the light source delivers light
2 having a wavelength of about 240 nm to about 280 nm, or delivers light in the red
3 visible range.

1 27. The apparatus of Claim 24, wherein the source of energy is a
2 radioactive pellet positioned within the elongated body.

1 ~~sub A2~~ 28. A method of treating asthma to control bronchospasms, the method
2 comprising:
3 irradiating the walls of an airway in a lung in a wavelength and
4 intensity which causes a change in smooth muscle tissue cells and prevents the
5 smooth muscle tissue cells from replicating; and
6 controlling bronchospasms by reduction or elimination of smooth
7 muscle tissue.

1 ~~sub B2~~ 29. The method of Claim 28, wherein the irradiation of the walls is
2 performed by emitting a light energy having a wavelength of about 240 nm to
3 about 280 nm.

1 ~~sub B3~~ 30. The method of Claim 28, wherein the irradiation of the walls is
2 performed by emitting light energy having a wavelength in the red visible range.

1 31. The method of Claim 28, wherein the irradiation of the walls is
2 performed by exposing the walls to radiation emitted by a radioactive pellet.

1 32. The method of Claim 28, wherein the irradiation of the walls is
2 performed by moving an energy delivery device along the airway.

1 ~~sub A3~~ 33. A method of treating respiratory conditions to control mucus
2 plugging, the method comprising:

3 irradiating the walls of an airway in a lung in a wavelength and
4 intensity which causes a change in mucus gland cells and prevents the mucus gland
5 cells from replicating; and
6 preventing mucus plugging by reduction or elimination of mucus
7 glands.

1 *Sub B5* 34. The method of Claim 33, wherein the irradiation of the walls is
2 performed by emitting a light energy having a wavelength of about 240 nm to
3 about 280 nm.

1 35. The method of Claim 33, wherein the irradiation of the walls is
2 performed by emitting light energy having a wavelength in the red visible range.

1 36. The method of Claim 33, wherein the irradiation of the walls is
2 performed by exposing the walls to radiation emitted by a radioactive pellet.

1 37. The method of Claim 33, wherein the irradiation of the walls is
2 performed by moving an energy delivery device along the airway.

1 *Sub A1* 38. A method of treating an esophagus to reduce achalasia or
2 esophageal spasm, the method comprising:
3 irradiating the walls of an esophagus in a wavelength and intensity
4 which causes a change in smooth muscle cells and prevents the smooth muscle
5 cells from replicating; and
6 preventing spasms of the smooth muscle tissue by elimination or
7 reduction of the smooth muscle tissue.

1 ~~sub 37~~ 39. The method of Claim 38, wherein the irradiation of the walls is
2 performed by emitting a light energy having a wavelength of about 240 nm to
3 about 280 nm.

1 40. The method of Claim 38, wherein the irradiation of the walls is
2 performed by emitting light energy having a wavelength in the red visible range.

1 41. The method of Claim 38, wherein the irradiation of the walls is
2 performed by exposing the walls to radiation emitted by a radioactive pellet.

1 42. The method of Claim 38, wherein the irradiation of the walls is
2 performed by moving an energy delivery device along the esophagus.

1 ~~sub 45~~ 43. A method of treating an ureter or an urethra to control spasms, the
2 method comprising:
3 irradiating the walls of an ureter or an urethra in a wavelength and
4 intensity which causes a change in smooth muscle cells and prevents the smooth
5 muscle cells from replicating; and
6 preventing spasms of smooth muscle tissue by elimination or
7 reduction of the smooth muscle tissue.

1 ~~sub 48~~ 44. The method of Claim 43, wherein the irradiation of the walls is
2 performed by emitting a light energy having a wavelength of about 240 nm to
3 about 280 nm.

1 45. The method of Claim 43, wherein the irradiation of the walls is
2 performed by emitting light energy having a wavelength in the red visible range.

1 46. The method of Claim 43, wherein the irradiation of the walls is
2 performed by exposing the walls to radiation emitted by a radioactive pellet.

1 47. The method of Claim 43, wherein the irradiation of the walls is
2 performed by moving an energy delivery device along the ureter or urethra.

1 48. A method of training a person to treat a body conduit by irradiation
2 comprising demonstrating or instructing the steps of:

3 irradiating walls of a body conduit with energy in wavelength and
4 intensity which causes a change in smooth muscle tissue cells and prevents the
5 smooth muscle tissue cells from replicating; and
6 controlling spasms of smooth muscle tissue by elimination or
7 reduction in the smooth muscle tissue surrounding the body conduit.

1 49. The method of Claim 48, wherein the body conduit is selected from
2 a group consisting of an airway in a lung, an esophagus, a ureter, and a urethra.

Add A1